WHAT IS CLAIMED IS:

1. A fluid control and processing system comprising:

a housing having a plurality of chambers; and

a valve body including a first fluid processing region continuously coupled fluidicly with a fluid displacement region, the fluid displacement region being depressurizable to draw fluid into the fluid displacement region and pressurizable to expel fluid from the fluid displacement region, the valve body including a plurality of external ports, the first fluid processing region being fluidicly coupled with at least two of the external ports, the fluid displacement region being fluidicly coupled with at least one of the external ports of the valve body, and the valve body being adjustable with respect to the housing to allow the external ports to be placed selectively in fluidic communication with the plurality of chambers,

wherein at least one of the plurality of chambers is a processing chamber, the processing chamber including a first port and a second port for selectively communicating with at least one of the external ports of the valve body, the processing chamber providing an additional fluid processing region.

2. The system of claim 1 wherein at least one of the fluid processing regions in the valve body or in the processing chamber contains a fluid processing material which is an enrichment material or a depletion material.

3. The system of claim 2 wherein the fluid processing material comprises at least one solid phase material.

4. The system of claim 3 wherein the solid phase material comprises at least one of beads, fibers, membranes, filter paper, glass wool, polymers, and gels.

5. The system of claim 3 wherein the fluid processing material comprises a filter and beads.

6. The system of claim 3 wherein the fluid processing material comprises at least two types of beads.

7. The system of claim 6 wherein the at least two types of beads perform at least two different functions which are selected from the group consisting of cell capture, cell lysis, binding of analyte, and binding of unwanted material.

8. The system of claim 1 wherein at least one of the fluid processing regions contains a solid phase material which performs at least two different functions selected from the group consisting of cell capture, cell lysis, binding of analyte, and binding of unwanted material.

9. The system of claim 2 wherein the fluid processing material comprises at least one liquid phase material.

10. The system of claim 9 wherein the liquid phase material comprises at least one of ficoll, dextran, polyethylene glycol, and sucrose.

11. The system of claim 2 wherein the fluid processing material is contained in the fluid processing region by one or more frits.

12. The system of claim 1 wherein the external ports are disposed on a generally planar external port surface of the valve body, and wherein the valve body is rotatable around an axis and relative to the plurality of chambers to allow the external ports to be placed selectively in fluidic communication with the plurality of chambers, the axis being perpendicular to the external port surface, and the external ports being spaced from the axis by a common radius.

13. The system of claim 1 wherein at least one of the fluid processing regions contains one type of beads which perform at least two different functions selected from the group consisting of cell capture, cell lysis, binding of analyte, and binding of unwanted material.

14. The system of claim 1 wherein the processing chamber includes a receiving area for receiving a processing module containing an enrichment material or a depletion material.

15. The system of claim 14 wherein the processing chamber further includes a collection area for receiving fluid that has flowed through the processing

module, and wherein the processing module includes means for retaining the enrichment or depletion material in the processing module and a spout for directing the fluid into the collection area.

16. The system of claim 1 wherein at least one of the chambers is a reagent chamber containing dried or lyophilized reagents.

17. A fluid control and processing system comprising:

a housing having a plurality of chambers and at least one separation channel; and

a valve body including a fluid processing region continuously coupled fluidicly with a fluid displacement region, the fluid displacement region being depressurizable to draw fluid into the fluid displacement region and pressurizable to expel fluid from the fluid displacement region, the valve body including at least one external port, the fluid processing region being fluidicly coupled with the at least one external port, the fluid displacement region being fluidicly coupled with at least one external port of the valve body, and the valve body being adjustable with respect to the housing to allow the at least one external port to be placed selectively in fluidic communication with the plurality of chambers and with the at least one separation channel.

18. The system of claim 17 further comprising a plurality of electrodes coupled to the housing to apply an electric field across at least a portion of the separation channel.

19. The system of claim 18 wherein the electrodes comprise a pair of metal tubes at the two opposite ends of the separation channel.

20. The system of claim 17 further comprising reservoirs fluidicly coupled to opposite ends of the separation channel, and a reservoir port fluidicly coupled to one of the reservoirs for communicating with the at least one external port of the valve body.

21. The system of claim 17 wherein at least one of the chambers is a reagent chamber containing dried or lyophilized reagents.

22. A method for controlling fluid flow between a valve, a plurality of chambers, and at least one separation channel, the valve including at least one external port and a fluid displacement region continuously coupled fluidicly with a fluid processing region which is fluidicly coupled with the at least one external port, the method comprising:

adjusting the valve with respect to the plurality of chambers and the at least one separation channel to place the at least one external port selectively in fluidic communication with the plurality of chambers and the separation channel.

23. The method of claim 22 further comprising applying an electric field across at least a portion of the separation channel.

24. The method of claim 22 wherein the external port is placed in fluidic communication with the separation channel via a reservoir fluidicly coupled to one end of the separation channel, the reservoir having a reservoir port for communicating with the at least one external port of the valve body.

25. The method of claim 22 further comprising optically detecting species bands in the separation channel.

26. A fluid control and processing system comprising:

a housing having a plurality of chambers; and

a valve body including a fluid processing region continuously coupled fluidicly with a fluid displacement region, the fluid displacement region being depressurizable to draw fluid into the fluid displacement region and pressurizable to expel fluid from the fluid displacement region, the valve body including an external port, the fluid processing region being fluidicly coupled with the external port, the fluid displacement region being fluidicly coupled with the external port of the valve body, and the valve body being adjustable with respect to the housing to allow the external port to be placed selectively in fluidic communication with the plurality of chambers.

27. The system of claim 26 wherein the valve body is adjustable with respect to the housing to close the external port so that the fluid displacement region and the fluid processing region are fluidicly isolated from the chambers.

28. The system of claim 26 wherein at least one of the chambers or the fluid processing region contains an enrichment material or a depletion material.

29. The system of claim 28 wherein the enrichment or depletion material perform a function which is selected from the group consisting of cell capture, cell lysis, binding of analyte, and binding of unwanted material.

30. The system of claim 26 wherein at least one of the chambers is a processing chamber having inlet and outlet ports for selectively communicating with the external port of the valve body.

31. The system of claim 30 wherein the processing chamber includes a receiving area for receiving a processing module containing an enrichment material or a depletion material.

32. The system of claim 31 wherein the processing chamber further includes a collection area for receiving fluid that has flowed through the processing module, and wherein the processing module includes means for retaining the enrichment or depletion material in the processing module and a spout for directing the fluid into the collection area.

33. The system of claim 26 wherein at least one of the chambers is a reagent chamber containing dried or lyophilized reagents.

34. The system of claim 26 wherein the fluid displacement region is depressurizable by increasing in volume and is pressurizable by decreasing in volume.

35. The system of claim 34 further comprising a fluid displacement member disposed in the fluid displacement region, the fluid displacement member being movable to adjust the volume of the fluid displacement region.

36. The system of claim 35 wherein the fluid displacement member comprises a piston movable in a linear direction in the fluid displacement region.

37. The system of claim 36 wherein the fluid displacement member comprises a piston shaft which is connected to a distal portion of a piston rod for driving

the piston shaft to move inside the fluid displacement region, the piston shaft being smaller in cross-section than the piston rod.

38. The system of claim 26 further comprising an energy transmitting member operatively coupled with the fluid processing region for transmitting energy thereto to process fluid contained therein.

39. The system of claim 38 further comprising a cover disposed between the fluid processing region and the energy transmitting member.

40. The system of claim 39 wherein the cover comprises a rigid shell.

41. The system of claim 39 wherein the energy transmitting member comprises an ultrasonic member for transmitting ultrasonic energy through the cover into the fluid processing region.

42. The system of claim 26 wherein the valve body includes a crossover channel, the valve body being adjustable with respect to the housing to place the crossover channel in fluidic communication with an aspiration chamber and a source chamber to permit aspiration of a fluid from the source chamber through the crossover channel to the aspiration chamber.

43. The system of claim 42 wherein the body is rotatably adjustable around an axis, and wherein the at least one external port is disposed within a range of external port radii from the axis and the crossover channel is disposed within a range of crossover channel radii from the axis, the range of external port radii and the range of crossover channel radii being non-overlapping.

44. The system of claim 43 wherein the crossover channel is a circular arc lying on a common crossover channel radius from the axis.

45. The system of claim 26 wherein at least two of the plurality of chambers are separated by a flexible wall to permit change-over of chamber volumes between the chambers.

46. A fluid control and processing system for controlling fluid flow among a plurality of chambers, the system comprising:

a body including a fluid processing region continuously coupled fluidicly with a fluid displacement region, the fluid displacement region being depressurizable to draw fluid into the fluid displacement region and pressurizable to expel fluid from the fluid displacement region, the body including at least one external port, the fluid processing region being fluidicly coupled with the at least one external port, the fluid displacement region being fluidicly coupled with at least one external port of the valve body, and the body being rotatably adjustable relative to the plurality of chambers to place the at least one external port selectively in fluidic communication with the plurality of chambers.

47. The system of claim 46 wherein at least one of the chambers or the fluid processing region contains an enrichment material or a depletion material.

48. The system of claim 46 wherein at least one of the chambers is a reagent chamber containing dried or lyophilized reagents.